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ABSTRACT

Colorado's Pawnee Grasslands are well suited for a wide range of academic study, from astronomy to zoology. Designed for educators and youth leaders seeking to integrate an alternative experience into their curriculum or recreation program, this guide is intended to give leaders of excursions to the Grasslands a sense of what's out there and some ideas on how to creatively use the environment. The guide presents information on the: Grasslands as a learning environment; archaeological sequence in the Central Great Plains; recent American Indian history; the Buffalo Range from 1850 to 1880; migration and settlement patterns in Northeastern Colorado; settlement dates of selected towns in Northeastern Colorado; white man and the Grasslands; geology of the Pawnee Grasslands--soil, climate, precipitation and temperature, important grasses, and birds and mammals; development of a unit--an interdisciplinary approach to the Grasslands, activity sites, equipment, safety, food and water suggestions, nutritional components in the edible portion of one pound of food, sample ideas for experience-oriented interdisciplinary Grasslands units; and Grasslands information sources covering anthropology, environment, Indian history, literature, outdoor skills/logistics of field trips, and pioneer history. (NQ)

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RESOURCE GUIDE TO

THE PAWNEE GRASSLANDS

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A RESOURCE GUIDE TO THE PAWNEE GRASSLANDS

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COLORADO OUTWARD BOUND SCHOOL

August 1975

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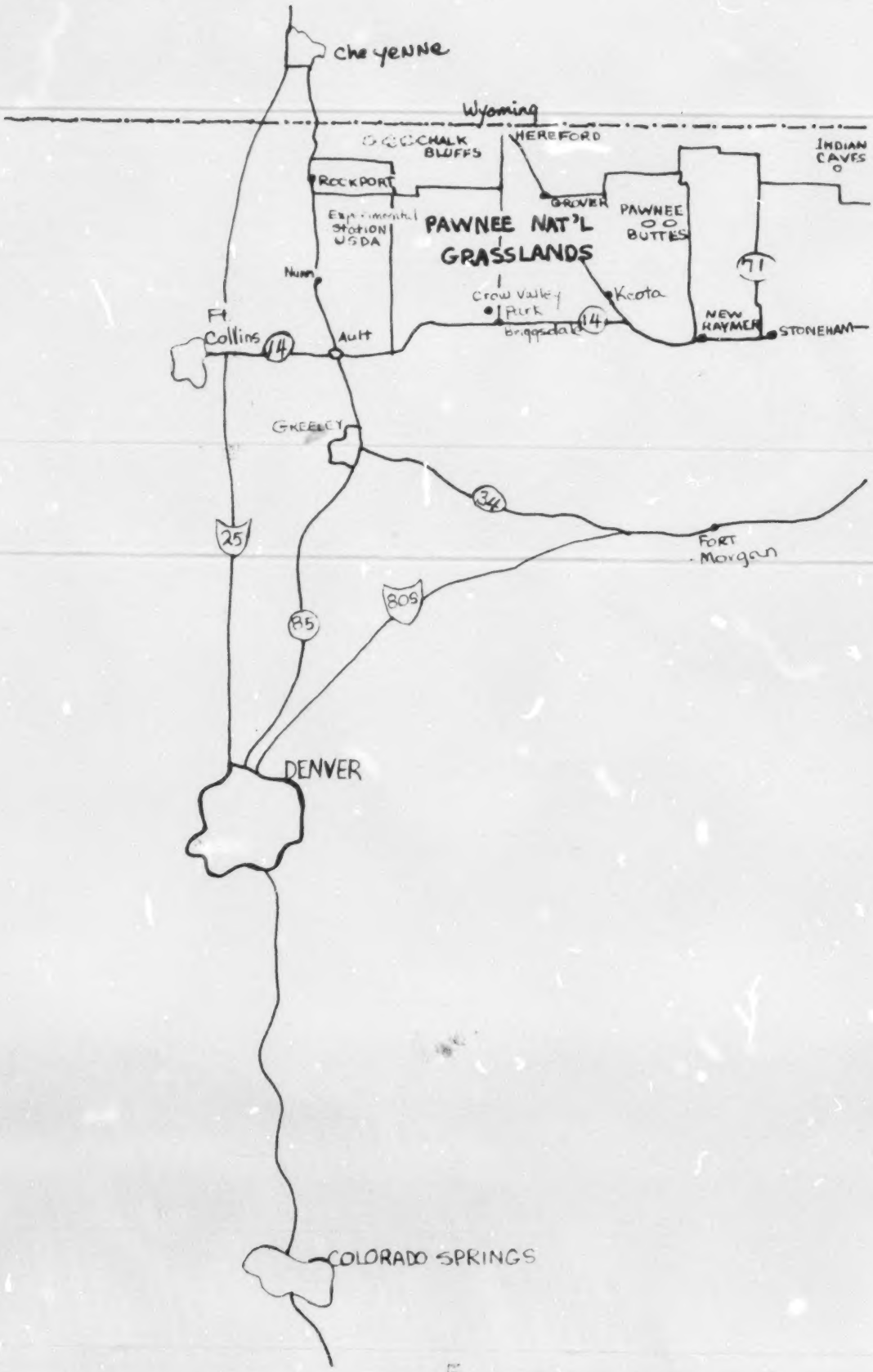
Cheyenne
Wyoming
CHALK BLUFFS
HEREFORD
INDIAN CAVES
ROCKPORT
Experimental Station USDA
PAWNEE NAT'L GRASSLANDS
GROVER
PAWNEE BUTTES
Nunn
Crow Valley
Kcota
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DENVER
COLORADO SPRINGS

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INTRODUCTION:

THE GRASSLANDS AS A LEARNING ENVIRONMENT

Few people today along the Colorado Front Range gaze anywhere but west to the mountains. Since the earliest 19th century travelers first viewed the rugged western skyline, attention has focused toward the setting sun. Unlike his red forebearers, the present residents of Colorado have taken the high plains to the east for granted.

Schools seeking an environmental focus in their classes study the mountain ecosystems. Colorado history carefully details the gold rush and the towns of Leadville, Cripple Creek and Central City. School buses ply the passes and backpackers line the trails as classes add experience to their theoretic study of Colorado. Drama and high adventure are synonymous with the high country while the plains to the east are barely recognized as having a past or a present. James Michener's Centennial may change some of this as more people come to recognize the complexity of historical and natural forces that have combined to make the grasslands. We hope so. We also hope that schools might join the 180 degree turn to the east and consider using the few remaining public areas such as the Pawnee National Grasslands as outdoor classrooms. The plains setting is not as easily adapted to school use as the mountains. The flora and fauna are far less dramatic and generally less understood. Historical remnants have faded quickly in the harsh climate. The outdoor activities appropriate to a plains program are less obvious and the aesthetics far more subtle than a powerful mountain vista. It requires more work to make the plains a classroom or a recreation setting -- but we feel the rewards are considerable.

The purpose of this guide is to give leaders of excursions to the Grasslands a sense of what's out there and some ideas on how to creatively use this environment. It is especially designed for educators and youth leaders who seek to integrate an alternative experience into their curriculum or recreation program. As the following materials suggest, the Pawnee Grasslands are well suited for a wide range of academic study, literally from astronomy to zoology. For leaders focusing on adventure, recreation, or combining academic field studies with outdoor activity, the possibilities are also considerable.

Colorado OUTWARD BOUND sponsored a group reconnaissance to the Pawnee Grasslands in April 1975. Four youth leaders from Denver joined the OUTWARD BOUND coordinator. All were interested in using the Grasslands as a program area for youth groups. None of the four had been to this northeastern Colorado area so aptly described by James Michener. Since a major objective of the workshop was to transfer how this area might be used with youth groups, involvement of all participants in a team reconnaissance seemed logical. Not only did the workshop members respond well to involvement in preplanning, but they have opted since to help write this resource guide to the Grasslands!

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[1] A more detailed description of the methodology used to plan our resource gathering venture is found in an OUTWARD BOUND report entitled "Team Reconnaissance: A Process for involving teachers in the Preplanning of Experiential Education," by Jim Kielsmeier.

ARCHAEOLOGICAL SEQUENCE IN THE CENTRAL GREAT PLAINS

Complex or Period	Years Ago	Distinctive Features	Plains Distribution or Sites in N. E. Colo.
Big Game Hunting	11,000+-	Pleistocene mammals and bison hunted	Throughout Plains
Elephant Hunters	11,000+-	Clovis Fluted Point - spears; Mammoth hunters	Dent, Colorado Clovis, New Mexico
Bison Hunters	11,000 - 7,000	Lanceolate points; spears	Throughout Plains
Folsom Complex	11,000 - 9,000	Folsom Fluted Points	Lindemeir site, Colo. Folsom, New Mexico
Plano Complex	9,000 - 7,000	Lanceolate Unfluted points:	Throughout Plains
		Plainview	Pawnee Buttes
		Eden	Claypool, Colo. Pawnee Buttes
		Scottsbluff	Scottsbluff, Nebr. Claypool, Colo.
		Midland	Lindemeir site, Colo.
		Others	
Altithermal	7,000 - 4,500	Warm, dry period; extinction of many Pleistocene mammals; little record of human occupation of the Plains	

ARCHAEOLOGY - cont'd.

Complex or Period	Years Ago	Distinctive Features	Plains Distribution or Sites in N. E. Colo.
Plains Archaic Period	4,500 - 2,000	Foraging for food important; bison hunting also, especially in late period. Milling stones appear. Spears still used. Flint workmanship poor in early period. Points mostly corner-notched; include McKean, Duncan, Hanna, Green River, and Glendo	Throughout Plains Signal Buttes, Nebr. LoDais Ka, Colo. Ash Hollow Cave, Nebr. McKean, Wyo.
Late Prehistoric (Includes "Plains Woodland" and "Plains Village Traditions")	2,000 - 300	Pottery appears. Bow and arrow appear. Agriculture important, especially in eastern plains. Points small, delicate; include small Glendo, Reed, Washita, Harrell	Throughout Great Plains Pawnee Buttes
Upper Republican Aspect	900 - 600	Earth-covered lodges; villages. Agriculture in bottomlands; some small game hunting. Pottery with vertical cord marks on outside, tempered with coarse gravel. Small, trangular points.	Republican River and South Platte bottomlands. Agate Bluff, Colo., Signal Butte, Nebr.

ARCHAEOLOGY - cont'd.

Complex or Period	Years Ago	Distinctive Features	Plains Distribution or Sites in N. E. Colo.
Late Prehistoric (Cont.)			
Dismal River Aspect	300	Earth lodges. Distinctive baking pits. Principally hunters; some corn growing. Includes Apaches of 17th and 18th centuries. Pottery tempered with fine sand; thin and smooth. Small triangular points.	Dismal River, Nebr. Signal Butte, Nebr.
Historic Period	After 300	Stone-tipped weapons in early period; metal weapons later. "Horse-buffalo" culture develops in late period. Modern Plains Indian tribes.	Throughout Great Plains. Cheyenne and Arapahoe in N. E. Colo in late Historic Period.

[2] Robert Jack Badaracco, "An Interpretive Resource Analysis of Pawnee Buttes, Colorado," 1971

Recent INDIAN HISTORY

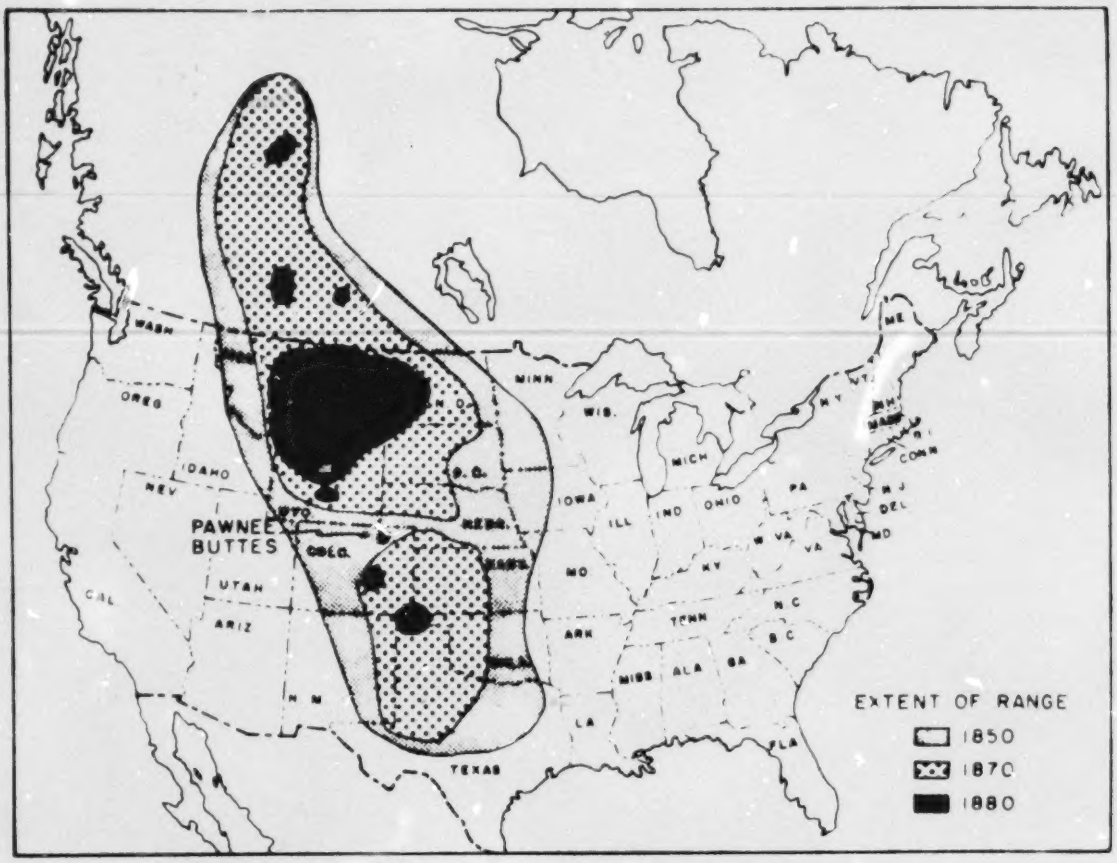
Five tribes of Indians have inhabited the Pawnee Grasslands area -- the Pawnee, Apache, Comanche, Cheyenne, and Arapahoe. There were earlier inhabitants of the area, but they were not immediate ancestors of the American Indians.

The first Indian inhabitants were the Pawnees who migrated to the area from the Southeastern United States around 1200 AD. They were displaced by the warlike Apaches who attacked them. The Apaches controlled this and adjacent areas during the 16th and 17th centuries. In the late 17th century, another migration occurred. This was the Ute-Aztelcan who split into two groups -- the Utes who moved into the southern Rocky Mountains, and the Comanches who inhabited eastern Colorado and Wyoming. They drove the Apaches into southern Texas. The Cheyenne and Arapahoe tribes were the latest Indian inhabitants of the area. They were closely allied tribes who had been forced out of the Great Lakes area by white men, and consequently moved west and south. By 1815, they were established as far south as the Arkansas River.

The Indians who inhabited the area were nomadic. They depended upon hunting for food, shelter, and clothing. They were "skin workers" -- their clothes were skin, teepees were skin, and their implements were made from their buffalo prey. They followed the herds; their life was nomadic so that their possessions were portable; they had no pottery.

Tribal boundaries were ill-defined. As a result, there were disagreements and wars; their war and militaristic systems were elaborate.

This culture, largely based on the buffalo, reached its height in the 19th century. There were enormous herds of buffalo supporting a vibrant people. It ended violently, irrevocably, when the white man brought war, disease, broken treaties and the destruction of the buffalo. The following chart depicts the rapid erosion of the buffalo range during the 19th century. Paralleling this decline was the fate of the Plains Indians.



BUFFALO RANGE, 1850 - 1880 (After Seton, 1927 and Dale, 1960)

MIGRATION AND SETTLEMENT PATTERNS IN NORTHEASTERN COLORADO, 1870 TO 1940

FIRST IMMIGRATION	
1870s	Beginning of major settlement. Union Colony at Greeley and other settlements along South Platte and its tributaries established.
1880s	Beginning of settlement on non-irrigable lands. First homesteads in Keota and Pawnee Buttes country.
FIRST EMIGRATION	
1889-90	Drought. Many leave non-irrigated lands.
SECOND EMIGRATION	
1893-94	Drought. More settlers leave non-irrigated lands. Keota and Pawnee Buttes country lose many settlers.
SECOND IMMIGRATION	
1900-1910	Great wave of immigration into northeastern Colorado. Weld County grows faster than at any other time in its history (before or after). Keota begins period of rapid growth.
THIRD IMMIGRATION	
1914-18	Third group of homesteaders and settlers arrive. Keota reaches peak in its development. Greatest historical concentration of homesteaders in Pawnee Buttes country.
THIRD EMIGRATION	
1920s	Agricultural depression. Many desert the Plains. Keota begins to fade.
FOURTH EMIGRATION	
1930s	National depression and great drought. Exodus from the Great Plains. Most settlers leave Pawnee Buttes country. Keota loses two-thirds of its population.

SELECTED TOWNS IN NORTHEASTERN COLORADO AND DATES FIRST SETTLED

Town	Date	Town	Date
Julesburg	1859	Keota	1888
Iliff	1881	Kaymer	1888
Sterling	1881	Stoneham	1888
Akron	1882	Nunn	1906
Brush	1882	Briggsdale	1909
Buckingham	1888	Hereford	1909
Grover	1888	Purcell	1910

charts by R. J. Badaracco

THE WHITE MAN AND THE LAND

How the Land was Used

The people of the 19th century and what they did are part of the National Grasslands story. How they used the land set the stage for later developments. The Indian made little use of the land other than to hunt its abundant wildlife. The early cattlemen used the land as it was, but without thought of management. Finally, the farmers came into grass country; they used the land and managed it -- but in some areas for purposes for which the land was not well suited.

Farming Brought Troubles

In the National Grasslands areas, farmers began with trouble and kept it as long as they tried to farm grass country. Few could make a good living on 160 acres in the high plains, but 160 acres were all a man could homestead under the law. Most new settlers eked out a bare subsistence on their little farms. For the most part their land was poor and unsuited for intensive cultivation, but the farmer's hopes were in cash crops, not grass.

Dust Storms and Depression

By the early 1930's, the farmers' situation was critical. Depressed crop prices and drought ruined marginal farms. Many people were supported by relief. Lands were abandoned or became tax delinquent. Debts mounted and mortgages were foreclosed.

There was less and less grass in grass country. Continual cultivation, recurrent dry years, excessive grazing, and relentless wind changed sod to dust. Farmlands were blowing away. Lands still in sod were severely damaged by dust blown from neighboring lands.

The hardships of those years are hard to imagine today. They impoverished the people; and they overburdened the resources of communities, counties, and states. Many people left the land. Others were stranded by poverty, debt, and lack of opportunity.

Something had to be Done

In 1934, a Federal land purchase program, adequate farm credit, and other measures brought much-needed relief. U.S. Department of Agriculture specialists worked with state agricultural colleges and state and county officials to determine the major problem areas. In these areas the Resettlement Administration purchased thousands of un-economic farms, retired them from intensive cultivation, and helped farm families find new opportunity in other areas.

Basic Change in Land Use

The land purchase program brought about a basic change in land use. Men began to manage their lands in ways better suited to these dry, windy plains. Farms and ranches that remained were generally larger and better able to operate economically. The areas purchased were slowly rehabilitated and became summer pastures. Sheep and cattle now became the chief agricultural product in grass country.

Grass Returns

Land Utilization Projects, as these areas were called, helped to bring grassland agriculture to the western plains. Grass resumed its rightful place as the dominant resource.

Under leadership of the Soil Conservation Service, grazing associations and Soil Conservation Districts were organized. They leased the new public ranges under controls guaranteeing range improvement and conservation. Land Utilization Project managers led the way in demonstrating conservation techniques and practices. Project managers, ranchers, and grazing associations worked together to improve the range in every respect. The work went forward and still goes forward, moving to the ultimate goal of a fully restored range.

Enter: National Grasslands

Now the Land Utilization Projects on the plains have become the National Grasslands and a part of the National Forest System. They are important units of a permanent system dedicated to principles of land conservation and use.

Adding strength to the government programs and extending the conservation principles to millions of adjacent acres are the cooperative efforts of ranchers, grazing associations, civic clubs, and sportsmen's groups. Together with these people who use the land, the Forest Service Ranger plans and works to demonstrate a practical way of using the resources. He realizes that grass country supports an economy and a way of life, not with grass alone, but with a blend of resources and products, uses and benefits, which is called multiple use. Keyed to the supremacy of grass, all natural resources are developed, managed, and used for proper land conservation.

This blend of multiple uses stands forth clearly when you see how all resources are interrelated. Grass could not survive without water. Soil could not receive its portion of water without deep-rooted sod. Grass holds and enriches the soil; it fattens cattle and sheep. Grass country supports a whole society of wildlife, linked together in mutual dependence. Water in streams and ponds serves man, livestock, and wildlife alike. And beside those waters grow trees, in whose shade man refreshes body and spirit.

Therefore, we see that the National Grasslands are a sequel to hard experience, and they exemplify new thinking about agriculture and resources in grass country. Their highest purpose will be to serve as demonstration areas, to show how lands classified as unsuitable for cultivation may be converted to grass for the benefit of both land and people. Under careful management they are being developed for greater sustained yields of grass, water, wildlife, and trees; they also offer new opportunities for outdoor recreation. A balance between the needs of people and the capabilities of the land is being attained. This balance is the insurance for a healthy future for both.

Come out into grass country and see the tangible evidence of conservation in practice. You will find accomplishments stemming from efforts of Federal, State, and local governments; of land owners and users; and local people from many walks of life interested in the land and its resource.

Credit for all of the above to:
"THE NATIONAL GRASSLAND STORY"
United States Department of Agriculture -- Forest Service -- PA 607

ENVIRONMENT

Geology of the Pawnee Grasslands

The area around the Grasslands is known as the Colorado Piedmont. A fascinating series of geologic events combined to produce this high plains area. Beginning with the Ancestral Rockies of 305 million years ago, the landscape of the region has been much affected by events to the west. This less dramatic precursor of the current Rockies was eroded to its roots sending its sediments east largely through the farming action of rushing rivers. Millions of years later the present Rockies emerged and again the process of gradual destruction descended upon the high peaks.

Of major importance to the present plains during this latter mountain building/destruction phase was a subsequent uplift of the plains followed by a period of considerable glaciation in the high mountain valleys. This uplift of 15 million years ago produced a steeper flow angle for water heading east to the plains. The glaciation in turn stored large quantities of ice in the mountains which when melted generated tremendous torrents of water that literally ripped off layers and layers of previous deposition in the plains area. This stripping action was most prevalent along the routes of the two principal rivers, the Arkansas and the South Platte.

The result of these activities today is a large erosional depression carved out of the high plains surface 50 to 75 miles east of the mountains and ranging south from the Wyoming border to around Pueblo. The recent dramatic erosional activity combined with low rainfall created a generally shallow topsoil and sod layer over the present Grasslands, which are major factors in the evolution of the short grass prairie.

The several phases of geologic history described here are very apparent today in the Grasslands. The Pawnee Buttes area in particular is a valuable geology classroom. The Chalk Cliffs and Indian caves also offer real evidence of geologic history for the observant student.

Soil

Soils of the Great Plains are characterized by their relatively dark color and a zone of lime accumulation below the surface.

Soils with lime horizons extend to the west beyond the Great Plains, and dark soils similarly extend beyond the Plains to the east; but nowhere else are the two characteristics found together. The dark color and associated alkaline layer are the product of the Plain's semiarid climatic conditions which have prevented leaching of the soils. The soils of the Great Plains are potentially among the most fertile in the world when supplied with sufficient water for crop growth.

Variety of soils:

Eastern section -- deep dark prairie and reddish prairie soils

Central -- chernozems which grade toward the chestnut and brown soils of the west

CLIMATE

It is a climate of extremes. There is frequent precipitation, but it is poorly distributed. Hailstorms are common, which result in much vegetation damage. Hot, dry winds from the south in summer parch the land. There are fierce winds and blizzards in the winter. Wind velocities are higher on mixed prairie than in any other part of the country except certain seashores.

Colorado has a highland continental climate. Westerly winds prevail; they lose much moisture as they pass over the mountains. The plains are left in semiarid condition. There is cold polar air from the north and warm moist air from the south. When the two air masses collide there is precipitation. This occurs most often in the spring. Summer precipitation is from local thunderstorms. Seventy to eighty per cent of the annual precipitation falls during the growing season, which is April through September. The temperatures are high; humidity is low. The prevailing winds are from the west, north, and northwest. The 3:00 PM wind velocity for Weld county is from 12-14 mph. The 3:00 PM wind velocity for the N. E. corner is from 14-16 mph.

There are severe weather phenomena: tornadoes, blizzards, hailstorms (which accompany thunderstorms), and drought. The last two are two of the most destructive forces.

PRECIPITATION IN INCHES AND HUNDREDTHS*
(Average based on 30-year period, 1931 to 1960 inclusive)

Weather Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Average
Ft. Collins	.38	.50	.95	1.86	2.90	1.73	1.15	1.53	1.20	1.08	.49	.42	14.19
Grover	.33	.43	.73	1.17	2.61	2.03	2.08	1.51	1.06	.65	.40	.30	13.30
Sterling	.33	.32	.76	1.50	2.06	2.58	1.84	1.54	1.12	.75	.41	.35	14.10
Julesburg	.41	.44	1.00	1.74	2.94	2.78	2.20	1.93	1.23	.73	.50	.42	16.32

*Compiled from U.S. Dept. Commerce, 1962.

TEMPERATURE AVERAGES IN DEGREES AND TENTHS FAHRENHEIT*
(Based on 30-year period 1931 to 1960 inclusive)

Weather Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Average
Fort Collins	26.6	29.7	36.2	46.4	55.4	64.9	71.0	69.2	60.7	49.8	36.7	30.4	48.1
Grover	26.9	29.2	34.7	45.0	54.4	64.6	71.6	70.1	61.5	50.7	37.1	30.8	48.1
Sterling	24.8	28.9	36.0	47.9	57.4	67.4	73.9	72.2	62.3	50.8	36.4	28.2	48.9
Julesburg	27.7	31.2	37.5	49.4	59.3	69.3	76.4	74.5	64.7	52.6	38.2	30.3	50.9

*Compiled from U.S. Dept. Commerce, 1962 (charts by Badaracco)

IMPORTANT GRASSES

Type	Dominant Plants	Associated Plants	Edaphic/Physical Factors
1. Short grass	Blue grama, buffalo grass	Thread-leaf sedge, ring muhly, western wheatgrass, prickly pear	Flat to undulate upland, aggraded soils
2. Mixed Prairie	Needle-and-thread grass, western wheatgrass, June-grass, blue grama, buffalo grass, slimflower scurfpea	Broom snakeweed, fringed sage, Astragalus sp., Oxytropis sp., other forbs	Lighter and more sandy soils than above
3. Little bluestem	Little Bluestem	Canada rye, Phlox sp., Cryptantha sp., misc. grasses and forbs	Swales; northfacing slopes; sandy-gravelly breaks; arroyos
4. Shrub-Steppe	Fourwing saltbush, small soapweed, common winterfat or other shrubs in association with short grasses and midgrasses	Other shrubs, half shrubs, forbs	As in 1 or 2 but with possible greater soil alkalinity for saltbush
5. Arroyo	Rocky Mountain juniper, choke cherry	Little bluestem, Canada rye, "break-shrubs"	Gullies, main drainages

chart by Badaracco

CHECKLIST OF BIRDS OF THE PAWNEE NATIONAL GRASSLANDS*

Species	Species
Eared Grebe	Long-billed curlew
Western grebe	Whimbrel (one record only)
Pied-billed grebe	Upland plover
Great blue heron	Spotted sandpiper
Black-crowned night heron	Solitary sandpiper
Yellow-crowned night heron	Willet
Canada goose	Greater yellowlegs
Mallard	Lesser yellowlegs
Gadwall	Pectoral sandpiper
Pintail	Baird's sandpiper
Green-winged teal	Least sandpiper
Blue-winged teal	Long-billed dowitcher
Cinnamon teal	Marbled godwit
American widgeon	Hudsonian godwit
Shoveler	American avocet
Redhead	Wilson's phalarope
Canvasback	Northern phalarope
Greater scaup	California gull
Lesser scaup	Ring-billed gull
Common goldeneye	Franklin's gull
Ruddy duck	Forster's tern
Common merganser	Black tern
Turkey vulture	Rock dove
Cooper's hawk	Mourning dove
Sharp-shinned hawk	Barn owl
Red-tailed hawk	Great horned owl
Swainson's hawk	Burrowing owl
Rough-legged hawk	Long-eared owl
Ferruginous hawk	Short-eared owl
Golden eagle	Poor-will
Bald eagle	Common nighthawk
Marsh hawk	Broad-tailed hummingbird
Gyrfalcon	Belted kingfisher
Prairie falcon	Red-shafted flicker
Peregrine falcon	Red-headed woodpecker
Pigeon hawk	Hairy woodpecker
Sparrow hawk	Downy woodpecker
Scaled quail	Eastern kingbird
Ring-necked pheasant	Western kingbird
Sandhill crane	Cassin's kingbird
Sora	Say's phoebe
American coot	Western flycatcher

Species	Species
Killdeer	Western wood pewee
Mountain plover	Olive-sided flycatcher
Horned lark	Bobolink
Tree swallow	Western meadowlark
Rough-winged swallow	Yellow-headed blackbird
Barnswallow	Red-winged blackbird
Cliff swallow	Orchard oriole
Purple martin	Baltimore oriole
Bluejay	Bullock's oriole
Black-billed magpie	Brewer's blackbird
Common crow	Common grackle
Black-capped chickadee	Brown-headed cowbird
Mountain chickadee	Black-headed grosbeak
Red-breasted nuchatch	Blue grosbeak
House wren	Dickcissel
Mockingbird	House finch
Catbird	Gray-crowned rosy finch
Brown thrasher	Black rosy finch
Sage thrasher	Common redpoll
Robin	Pine siskin
Hermit thrush	American goldfinch
Swainson's thrush	Red crossbill
Mountain bluebird	Green-tailed towhee
Townsend's solitaire	Rufous-sided towhee
Sprague's pipit	Lark bunting
Bohemian waxwing	Savannah sparrow
Northern shrike	Grasshopper sparrow
Loggerhead shrike	Vesper sparrow
Starling	Baird's sparrow
Red-eyed vireo	Cassin's sparrow
Orange-crowned warbler	Lark sparrow
Virginia's warbler	Black-throated sparrow
Yellow warbler	Sage sparrow
Myrtle warbler	Slate-colored junco
Audubon's warbler	Oregon junco
Townsend's warbler	Gray-headed junco
Chestnut-sided warbler	Tree sparrow
Blackpoll warbler	Chipping sparrow
Northern water thrush	Clay-colored sparrow
MacGillivray's warbler	Brewer's sparrow
Yellowthroat	White-crowned sparrow
Wilson's warbler	Song sparrow
Canada warbler	McCown's longspur
American redstart	Lapland longspur
House sparrow	Chestnut-collared longspur

*(After Ryder, 1970)
from Badaracco

A MAMMAL CHECKLIST FOR THE PAWNEE GRASSLANDS

Scientific Name	Common Name
Order INSECTIVORA -- Insectivores	
Family SORICIDAE -- Shrews	
Sorex cinereus	Masked shrew
Sorex vagrans	Vagrant shrew
Sorex nanus	Dwarf shrew
Sorex merriami	Merriam's shrew
Order CHIROPTERA -- Bats	
Family VESPERTILLIONIDAE -- Vespertilionid Bats	
Myotis lucifugus	Little brown myotis
Myotis evotis	Long-eared myotis
Myotis thysanodes	Fringed myotis
Myotis volans	Long-legged myotis
Myotis californicus	California myotis
Myotis subulatus	Small-footed myotis
Lasionycteris noctivagans	Silver-haired bat
Eptesicus fucus	Big brown bat
Order LAGOMORPHA -- Lagomorphs	
Family LEPORIDAE -- Hares and Rabbits	
Sylvilagus floridanus	Eastern cottontail
Sylvilagus nuttalli	Nuttall's cottontail
Sylvilagus audubonii	Desert cottontail
Lepus townsendii	White-tailed jack rabbit
Lepus californicus	Black-tailed jack rabbit
Order RODENTIA -- Rodents	
Family SCIURIDAE --Squirrels	
Eutamias minimus	Least chipmunk
Marmota flaviventris	Yellow-bellied marmot
Spermophilus tridecemlineatus	Thirteen-lined ground squirrel
Cynomys ludovisianus	Black-tailed prairie dog
Sciurus niger	Fox squirrel
Family GEOMYIDAE -- Pocket Gophers	
Thomomys talpoides	Northern pocket gopher
Family HETEROMYIDAE -- Heteromyids	
Perognathus fasciatus	Olive-backed pocket mouse
Perognathus flavescens	Plains pocket mouse
Perognathus flavus	Silky pocket mouse
Perognathus hispidus	Hispid pocket mouse
Dipodomys ordii	Ord's kangaroo rat

Scientific Name	Common Name
Family CASTORIDAE -- Beavers	
Castor canadensis	Beaver
Family CRICETIDAE -- New World Rats and Mice	
Reithrodontomys montanus	Plains harvest mouse
Reithrodontomys megalotis	Western harvest mouse
Peromyscus maniculatus	Deer mouse
Peromyscus difficilis	Rock mouse
Onychomys leucogaster	Northern grasshopper mouse
Neotoma mexicana	Mexican wood rat
Neotoma cinerea	Bushy-tailed wood rat
Microtus pennsylvanicus	Meadow vole
Microtus longicaudus	Long-tailed vole
Microtus ochrogaster	Prairie vole
Lagurus curtatus	Sagebrush vole
Ondatra zibethicus	Muskrat
Family MURIDAE -- Old World Rats and Mice	
Rattus norvegicus	Norway rat
Mus musculus	House mouse
Family ERETHIZONTIDAE -- New World Porcupines	
Erethizon dorsatum	Porcupine
Order CARNIVORA -- Carnivores	
Family CANIDAE -- Canids	
Canis latrans	Coyote
Vulpes vulpes	Red fox
Vulpes macrotis	Kit fox
Family PROCYONIDAE -- Procyonids	
Procyon lotor	Raccoon
Family MUSTELIDAE -- Mustelids	
Mustela erminea	Ermine
Mustela frenata	Long-tailed weasel
Mustela nigripes	Black-footed ferret
Taxidea taxus	Badger
Spilogale putorius	Spotted skunk
Mephitis mephitis	Striped skunk
Family FELIDAE -- Cats	
Felis concolor	Mountain lion
Lynx rufus	Bobcat
Order ARTIODACTULA -- Even-toed Ungulates	
Family CERVIDAE -- Cervids	
Cervus canadensis	Wapiti
Odocoileus hemionus	Mule deer
Odocoileus virginiana	White-tailed deer
Family ANTILOCAPRIDAE -- Pronghorn	
Antilocapra americana	Pronghorn

*(After Hansen, 1969)
from Badaracco

DEVELOPING A GRASSLANDS UNIT

Putting it together: An Interdisciplinary Approach to the Grasslands

The first section gave specific information regarding the grasslands. This section offers suggestions for developing the grasslands into an educational resource which will complement classroom work.

One approach to the grasslands is an interdisciplinary approach. "Interdisciplinary study" is education jargon for fitting pieces of the typically fragmented curricular jigsaw puzzle into an interlocking whole. It is an attempt to give several disciplines a common thematic point of contact. Learning does not take place in a vacuum. As John Dewey pointed out, it requires a continuum of linkages, connections, and contacts with previously attained knowledge. The more points of association with already developed concepts the teacher can develop, the more that is new can be tied in.

The grasslands can serve as the focus of an interdisciplinary unit. The history of the area is interesting when studied in the classroom -- Indians, buffalo. It becomes powerfully alive when one stands at the base of the Pawnee Buttes where that history was made. English classes can explore Indian and plains literature and while at the grasslands, record their reactions in a journal. Science classes have the opportunity to study weather, soil, animal life, geology and flora. Government classes can identify pending legislation which may affect the grasslands. The climax of the studies is the experience when the students are in the field, tying together all of the classroom information.

This approach requires considerable planning.

I. Planning: This type of unit requires considerable lead time and cooperation among faculty. It is important to involve a wide range of varied people in the early stages of planning. Give yourselves plenty of time and do not bite off too grandiose a project. It is better to start small and then build in future years.

II. Classroom preparation: This should be well in advance of the experience. The disciplines participating should begin class work on the topic at the same time and should coordinate closely. Materials covered in participating classes should be discussed by the total unit faculty.

III. Student involvement: Where possible, students should feel a part of planning and implementation of the total unit. They will buy in more genuinely if they feel a part of the organizing effort. This will have a positive carry-over effect in the classroom and during the experience segment. Involving students is time-consuming initially but pays large dividends later.

IV. The connecting experience: Teachers and students should move evenly toward implementation. A logical progression of planning at every level should culminate with the field exercise. Clear goals for the experience should have been established and the activity evaluated against them. Connections between pre-trip and post-trip class activities should be built in. The experience should not be seen as an isolated venture but as an integral part of the whole interdisciplinary unit.

V. Follow-up: Processing of the activity is important. Teachers should milk every possible facet of the experience for relevant learning possibilities. Classes should literally take off into a variety of related study upon return from the field segment. Do not let down now. This is where much can be gained.

PAWNEE NATIONAL GRASSLANDS ACTIVITY SITES

SITE	DESCRIPTION	CAPACITY	WATER	SHELTER	PRIVATE OR PUBLIC	LOCATION	ACTIVITIES	SAFETY CONSIDERATIONS
Chalk Bluffs	Dramatic ridge of sandstone mesas rising from Grassland Prairie	Unlimited	No	No	Private Permission Required	c 10 miles NE of Rockport	Wildlife Studies Geology Orienteering Bird Studies	Heat, Snakes, Dehydration, Rocks
Pawnee Buttes	Two several hundred feet high Buttes rise from Grasslands "Impressive"	Unlimited	No	No	Public	c 10 miles SE of Zion Lutheran Church	Indian Studies Wildlife Geology Rock Climbing	Snakes, Exposure, Loose Rock
Pawnee Park		Unlimited	?	?	Public	3½ miles N of New Raymer	Botany & Soil studies Orienteering	Heat & Dehydration, getting lost
Crow Valley	Campground in Grove of Cottonwood Trees	Unlimited	Yes	Pavilion & Tables	Public	½ mile N of Briggsdale	Botany & Soil Bird Study Orienteering	Heat Exposure, Snakes
Indian Caves	Long Sandstone Cliff	Unlimited	No	No	Mixed	3 miles E of Uhl Reservoir	Wildlife Study Indian Study Orienteering	Snakes, Rocks, Heat & Dehydration
Teepee Rings	Evidence of Plains Indians Encampment		No	No	Public	c 3 miles NE of Keota	Indian Study	
Arch. Site	Some digging conducted		No	No	Mixed	c 5 miles SE of Pawnee Park	Indian Study	
Prairie Dog Town			No	No	Public	3 miles N of Pawnee Park	Wildlife Study	
Homestead Campground			No	No	Public	c 5 miles NW of Uhl Reservoir		

25 NOTE: These sites are not well marked and are difficult to find, especially at night. The Forest Service map of the Pawnee National Grassland, 1969, is essential. Topographic maps are not yet available. The Forest Service map can be obtained by writing the Ranger in Greeley. (See Resource Section for address) 26

EQUIPMENT, SAFETY, FOOD AND WATER SUGGESTIONS

I. Equipment

A. Personal gear:

1 pair wool pants
1 long-sleeved wool shirt
1 wool sweater
1 pair jeans
1 pair long underwear -- mesh top
2 pair wool socks
2 pair light cotton socks
1 wool cap
1 pair wool mitts or skiing gloves
1 pocket knife
1 pair sunglasses
1 brimmed sun hat (important)
1 backpack
1 cup and dish
1 ensolite pad
1 canteen
1 set of eating utensils
boots, medium weight (vibram sole optional)
rain gear (jacket with hood)
sleeping bag

Recommended items:

1 T-shirt (summer months)
1 set underwear
1 handkerchief
1 pair cutoffs (summer months)
1 pair gaitors (recommended during transitional times of the year - Spring & Fall)
1 light wind shirt or jacket
flashlight
lip salve
If you wear glasses, be sure to bring an extra pair.

B. Group items

Tent capable of sleeping three people
Small cooking stove (one per tent)
Coleman fuel or similar type of white gas
Binoculars

Maps (obtained at Ranger Station -- Greeley, Fort Collins, Federal Center in Denver)

Compasses

Matches (kept in waterproof container)

Candles

First-aid kit

One nylon climbing rope (optional)

Cooking pots (one set per stove)

Small shovel or pick for latrine

Water purification tablets, iodine or clorox

5-gallon water containers (# depending upon size of group)

II. Safety gear and considerations

1. One well-supplied first-aid kit that can be carried into the field.
   a. The kit should contain a good snake bite kit.
   b. The group should have everyone in the group become familiar with the kit and treatment of snake bite before entering the field.
2. During transitional months of Spring and Fall (March, April, October and November) groups should be prepared for winter blizzards.
   a. Alert Rangers and home base contacts of your schedule of activities on the Grasslands.
   b. Carry extra emergency rations, water & gas in vehicles to be able to sit out an extra 2 days.
   c. Carry shovels and flashlights in vehicles.
   d. Be alert to weather conditions prior to and during trip.

III. Food

A. Protein: needed for maintenance, building of body tissue; meat, cheese, nuts, eggs.

B. Fat: for basic energy; butter, bacon, nuts, cheese.

C. Carbohydrates: for quick energy; dried fruit, candy, sugar, cereal, vegetables.

Food can be viewed simply as a basic need or as a creative aspect of the unit. Depending on the needs of the group, the food situation can in fact become part of the program ideas: integrate a series of classes on nutrition into the unit and plan meals accordingly; use the students as a food planning team for the trip; plan and pack together; research Indian or Pioneer foods used on the plains and try to duplicate; use the trip as a time to experiment with alternative high nutrition food sources -- i.e. soy beans and wheat germ.

NUTRITIONAL COMPONENTS

in the EDIBLE PORTION of ONE POUND of FOOD

FOOD	calories	gr./lb. protein	gr./lb. fat	gr./lb. carbohydrate	*cost
soy proteinate	1415	365.3	.5	34.9	$ .44
sunflower seeds	2540	108.9	215.0	90.3	.75
roasted soybeans	1828	154.7	80.3	152.0	.79
canned clams	236	35.8	3.2	12.7	.96
canned beef	1016	113.0	59.0	0	1.55
canned chicken	890	98.4	53.1	0	1.86
dry salami	2041	108.8	172.3	5.4	1.89+
hard candy	1751	0	5.0	440.9	.75
milk chocolate	2359	34.9	146.5	258.1	1.00
M & M's	2114	23.6	89.4	329.8	1.31
noodles	1760	58.1	20.9	326.6	.55
rice	1696	34.0	.9	374.2	.65
macaroni	1674	56.7	5.4	341.1	.60
bulgar wheat	1605	50.8	6.8	343.4	.45
oatmeal, plain	1769	64.4	33.6	309.4	
oatmeal, with soy grits & wheat germ	1733	93.0	40.8	265.8	
margarine	3266	2.7	367.0	1.8	.40
sesame seeds	2554	64.4	222.7	98.0	.69
wheat germ	1647	120.7	49.4	211.8	.70
cream cheese	1696	35.8	171.0	9.5	.50
biscuit mix, plain	1923	34.9	57.2	399.2	
biscuit mix, of soy & whole wheat flour	1620	95.2	31.3	260.5	
cheddar cheese	1805	113.4	146.1	9.5	
swiss cheese	1678	119.8	127.0	7.7	
parmesan cheese	1783	163.3	117.9	13.6	

* for purposes of comparison, retail costs were used because wholesale costs were not available.

Information obtained from a paper on OUTWARD BOUND food by Jane Ann Mallory, 1974

IV. Water

Water is not readily available in the plains. Although one might be able to obtain water from a windmill, the water is generally hard and not recommended for drinking.

Water can be obtained at Crow Valley Park which might be considered as a base camp, although it is not centrally located to the grasslands.

Crow Valley is located roughly 22 miles east of Ault on Highway 14.

Homestead Campground is located 24 miles north of Stoneham on Highway 71 and is another possible base camp area and water supply.

The group could carry extra water in 5-gallon containers.

The Ranger at Briggsdale would be able to advise the group on water availability.

Sample Ideas for Experience-oriented Interdisciplinary Grasslands Units

I. Archaeology

A. Major concepts

1. the evolutionary process
2. The continuing flow of human existence

B. Supporting concepts

1. Recognize the changes that took place in the human population in the grasslands region
2. Learn indicators of change; artifacts
3. Understand process for discovering the archaeological record: field research

C. Experiential activities

1. Visit Chalk Cliff dig areas
2. Do surface collection using quadrant methodology
3. Visit local museums
4. Consult with archaeologists and anthropologists at local universities
5. Make an arrowhead, adze, or skinning knife

II. Ecology/environment/field science

A. Major concepts

1. Succession
2. Diversity
3. Limiting factors
4. Ecosystems and their balances or imbalances
5. Man and the environment: his effect

B. Supporting concepts

1. Food chains, animal and plant
2. Energy flow
3. Weather cycles
4. Pollution's effect on a particular ecosystem

C. Experiential activities

1. Chart a grasslands food chain
2. Examine under microscope the scat of a coyote
3. Do a quadrant study of all the flora in a small grasslands area
4. Obtain weather data on the grasslands from the weather bureau

5. Compare quadrant studies of grazed and ungrazed areas, north slopes and south slopes, along roads and in gullies, etc.
6. Build a solar still
7. Talk with the ranger, a rancher, a townsperson about the grasslands ecosystems. How do their perceptions differ?
8. Research the Forest Service management system for Grasslands.
9. Find out why the prairie falcon and golden eagle are dying out
10. Build a berlese funnel and do a comparative soil study of micro-organisms

III. History

A. Major concepts

1. Factors affecting Indian cycles on the plains
2. Factors bringing the white man
3. Reasons for interaction and conflict between the two civilizations
4. Current factors affecting history of the area

B. Supporting concepts

1. The role of the horse
2. The discovery of gold
3. "Manifest Destiny"
4. Technology: railroads, barbed wire, telegraph, repeating rifles, alcohol
5. Population pressures on the Indian and white man
6. The Civil War and the West
7. Ranching and sheep grazing
8. Dryland farming; the Great Depression and the New Deal

C. Experiential activities

1. Visit the Denver Art Museum Indian exhibits
2. Chart the Chisolm Trail to Colorado from Texas
3. Visit a ranch on the Grasslands
4. Visit a ghost town on the Grasslands
5. Talk to people in Briggsdale, Keota or Ault about the "early days;" the Depression and now
6. Attend a livestock auction
7. Make jerkey or pemmican and eat it on a trip to the Grasslands
8. Research the Plains Indian vision quest and use the ritual for a solo activity
9. Do a night hike on the Plains navigating by the North Star as Indians and pioneers did
10. Build a teepee and live in it.

IV. English/Literature

A. Major concepts

1. the sensory appeal and effect of the Plains
2. Symbols of the Plains reflected in writing

B. Supporting concepts

1. Journal writing -- what is it?
2. Nature's effect on literature -- an historical survey, i.e. from Thoreau to Leopold

C. Experiential activities

1. Keep a journal while on a trip to the Grasslands
2. Describe the horizon, a rock, a blade of grass
3. Face the wind and describe how your skin reacts, turn away and compare
4. Read portions of Indian literature while seated on a butte watching the sun set.
5. Camp in a pioneer ghost town and describe the experience
6. Try counting stars, or grains of sand then define infinity
7. Mime a plains mini-environment (small group activity)
8. Record a coyote's call in a poem.

These samples barely scratch the surface of what can be done in a Grasslands unit. Disciplines not mentioned such as chemistry, biology, geology, math and art all could be integrated into a unit. The limiting factor is not the Grasslands setting but the energy and creativity of the people using it as a teaching/learning medium.

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* indicates could also be listed under several other categories